# Product overview

Intel Eagle Stream platform

Lenovo

ThinkSystem V3 architecture overview

The Lenovo ThinkSystem V3 server is equipped with Next Generation Intel Xeon Scalable processors (formerly codenamed Sapphire Rapids), which are based on the Eagle Stream platform. They support Intel Advanced Matrix Extensions 512 (AMX) technology, PCIe 5.0, DDR5, and Intel Optane Persistent Memory 300 Series (PMem) modules.

Eagle Stream platform for ThinkSystem V3 servers

- Two CPU socket scalability support for ThinkSystem V3 servers
- There will be support for four and eight CPU socket scalability in the future
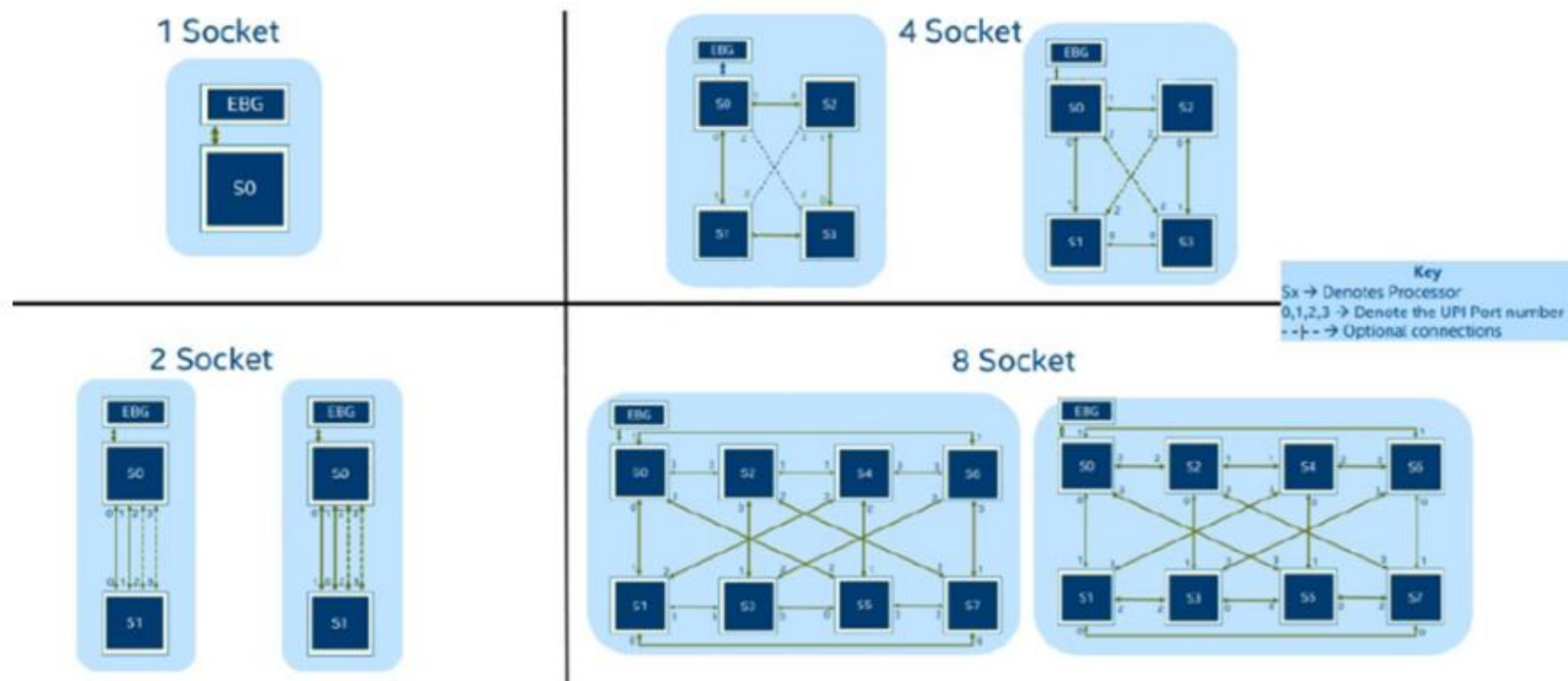
- SR630 V3, 2S/1U
- SR650 V3, 2S/2U
- ST650 V3, 2S/Tower
- SD650 V3, 2S/6U/12N
- SD650-I V3 2S/1U/4GPU

ThinkSystem SR650 V3 design concept

The new design concept for the Eagle Stream platform has the following features:

- 2S/2U design with four UPIs between two CPUs

- Eight DIMMs per CPU, support for two DIMMs per channel

- System management with the new BMC (AST2600)

- The system board does not include the module I/O board

- An additional module I/O board, the Root of Trust (ROT), for secure operations
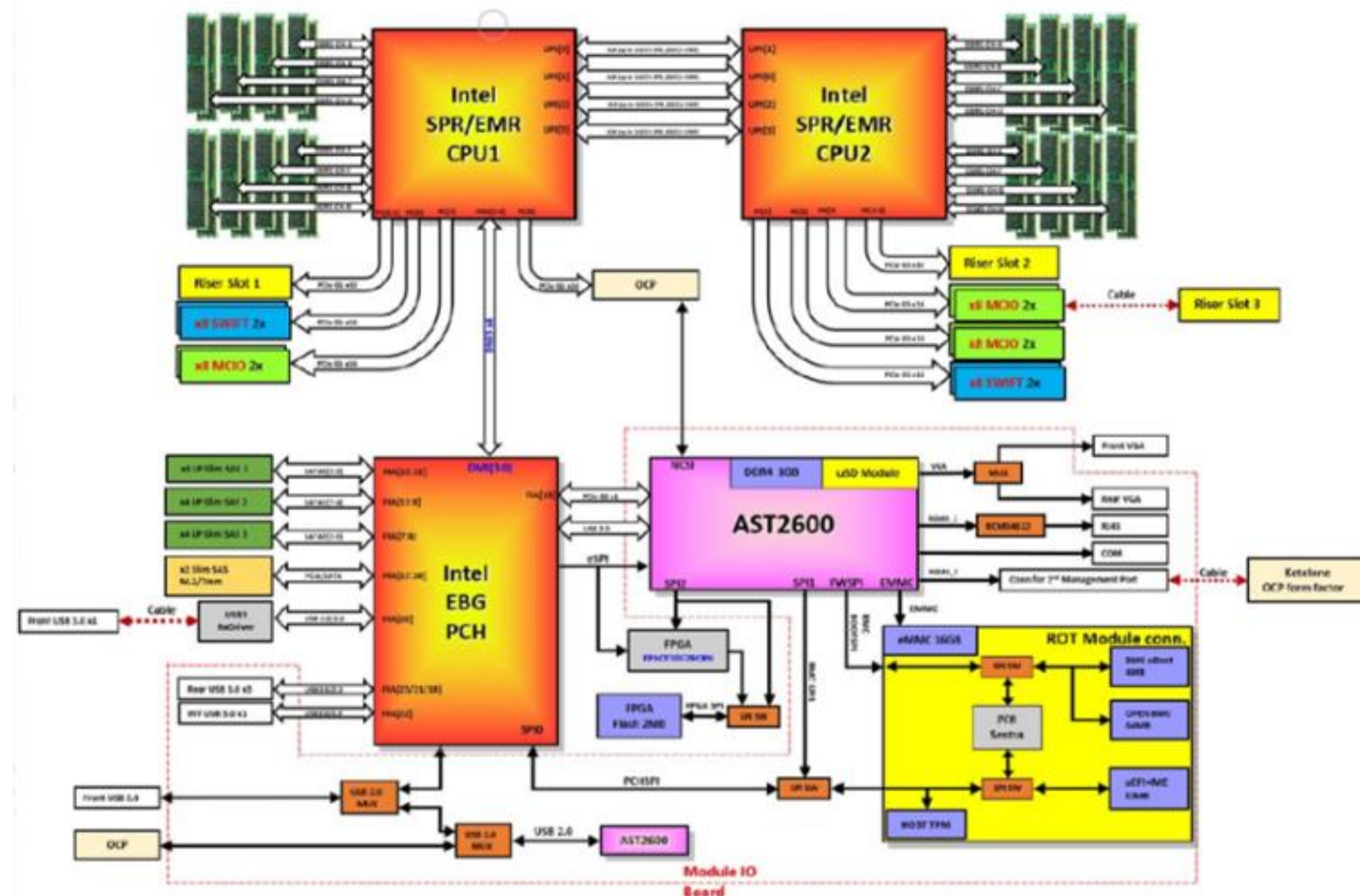
ThinkSystem V3 Series common features

- Mechanical "brick" design – CPU installation and removal with the heat sink

- Heat sinks - 1U Entry and 1U Performance type for high TDP power models

- 2U/4U system rack mechanicals

- RAID adapters and HBA

    – For supported RAID adapter and HBA specifications, refer to Lenovo ThinkSystem RAID Adapter and HBA Reference.

- Storage backplanes with 4th generation mechanical trays for drives

- Three M.2 enablement kits

    – ThinkSystem M.2 SATA 2-Bay RAID Enablement Kit

    – ThinkSystem M.2 NVMe 2-Bay RAID Enablement Kit

    – ThinkSystem M.2 SATA/NVMe 2-Bay Enablement Kit (non-RAID)

- Two rear 7 mm HDD enablement kits

    – Rear 7 mm SATA SSD RAID Enablement Kit and Rear 7 mm NVMe SSD RAID Enablement Kit

- Power Supplies – common form factor version 4

- New XCC chipset (Emulex Pilot4 BMC, owned by ASpeed)

- OCP NIC 3.0

    – NIC Mezz Card from two-port 1 GbE to four-port 10/25 GbE

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Intel Xeon Scalable processor platform roadmap

- There are two types of Intel Xeon Scalable processors on the Eagle Stream platform:
  - Sapphire Rapids (Next Generation Intel Xeon Scalable processor)
  - Emerald Rapids (Future Intel Xeon Scalable processor)
- Eagle Stream platform processor core counts:
  - Sapphire Rapids: eight to 60 cores
  - Emerald Rapids: eight to 64 cores
- The Eagle Stream platform with the new CPU socket can support higher TDPs and more processor SKUs

Platform comparison

- The Eagle Stream platform features the new Socket - E with more pins for more power
- The Eagle Stream platform features new UPI technology to increase CPU scalability to 8S
- The Eagle Stream platform supports DDR5 memory and increased memory speeds:
  - Sapphire Rapids: up to 4800 MT/s one DIMM per channel (1DPC)
  - Emerald Rapids: up to 5600 MT/s one DIMM per channel
- The Eagle Stream platform supports an Intel UPI 2.0 connection between the CPU and PCIe 0.5 to increase I/O bandwidth up to 80 lanes for more PCIe ports
- The Eagle Stream platform introduces the new Intel PCH C741

Specification	Whitley – Ice Lake	Eagle Stream –Sapphire Rapids	Eagle Stream –Emerald Rapids
CPU TDP	105 watts to 270 watts	125 watts to 350 watts	125 watts to 350 watts
Socket	Socket P+	Socket - E	Socket - E
Scalability	1S, 2S	1S, 2S, 4S, 8S	1S, 2S, 4S, 8S
Cores	40 cores	60 cores	64 cores
Memory	DDR4, eight channels	DDR5, eight channels	DDR5, eight channels
	3200 (2DPC)	4800 (1DPC) & 4400 (2DPC)	5600 (1DPC) & 4800 (2DPC)
Intel® UPI	Intel UPI 1.0 (two or three), 11.2 GT/s	Intel UPI 2.0 (up to four), 16 GT/s	Intel UPI 2.0 (up to four), 20 GT/s
PCIe	PCIe 4.0, 16 GT/s	PCIe 5.0, 32 GT/s	PCIe 5.0, 32 GT/s
	64 lanes (x16, x8, x4)	80 lanes (x16, x8, x4)	80 lanes (x16, x8, x4)
PCH	Intel C620A	Intel C741	Intel C741

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Product overview

CPU comparison

Platform / Processor Specification	CEDAR ISLAND	WHITLEY	EAGLE STREAM	EAGLE STREAM
	3rd Gen Intel Xeon Scalable Processors (Cooper Lake)	3rd Gen Intel Xeon Scalable Processors (Ice Lake)	Next Gen Intel Xeon Scalable Processors (Sapphire Rapids)	Next Gen Intel Xeon Scalable Processors (Emerald Rapids)
Core Count / CPU Socket	28 cores	40 cores	60 cores	64 cores
Socket Scalability (per node)	4S, 8S	1S, 2S	1S, 2S, 4S, 8S	1S, 2S, 4S, 8S
Max TDP	250 watts	270 watts	350 watts	350 watts
Memory support / Channels	DDR4, six channels	DDR4, eight channels	DDR5, eight channels	DDR5, eight channels
Memory max speeds	3200 (2DPC)	3200 (2DPC)	4800 (1DPC) & 4400 (2DPC)	5600 (1DPC) & 4800 (2DPC)
High Bandwidth Memory (HBM)	No	No	Yes, 1 TB/s Bandwidth, 64 GB HBM2e per socket	No
Intel UPI	UPI links per CPU (six)	UPI links per CPU (two or three)	UPI links per CPU (up to four)	UPI links per CPU (up to four)
	UPI 1.0 speed (10.4 GT/s)	UPI 1.0 speed (10.4 GT/s)	Intel UPI 2.0 (16 GT/s)	Intel UPI 2.0 (20 GT/s)
PCIe Generation (I/O)	48 PCIe 3.0 lanes (x16, x8, x4)	64 PCIe 4.0 lanes (x16, x8, x4)	80 PCIe 5.0 lanes (x16, x8, x4), PCIe 4.0 (x2)	80 PCIe 5.0 lanes (x16, x8, x4), PCIe 4.0 (x2)

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CPU comparison

Platform / Processor Specification	CEDAR ISLAND	WHITLEY	EAGLE STREAM	EAGLE STREAM
	3rd Gen Intel Xeon Scalable Processors (Cooper Lake)	3rd Gen Intel Xeon Scalable Processors (Ice Lake)	Next Gen Intel Xeon Scalable Processors (Sapphire Rapids)	Next Gen Intel Xeon Scalable Processors (Emerald Rapids)
PCIe Generation (I/O)	48 PCIe 3.0 lanes (x16, x8, x4)	64 PCIe 4.0 lanes (x16, x8, x4)	80 PCIe 5.0 lanes (x16, x8, x4), PCIe 4.0, (x2)	80 PCIe 5.0 lanes (x16, x8, x4), PCIe 4.0, (x2)
Intel Deep Learinig Boost (AI interface / Training)	Intel AVX-512 (VNNI/INT8 & BFloat16)	Intel AVX-512 (VNNI/INT8)	Intel AMX/TMUL (INT8 & BFloat16) & Intel AVX-512 (VNNI/INT8)	Intel AMX/TMUL (INT8 & BFloat16) & Intel AVX-512 (VNNI/INT8)
Security – Intel SGX & TDX	No	Intel SGX	Intel SGX (Enhanced)	Intel SGX, Intel TDX
Crypto Instructions	Legacy	Vector AES, SHA extensions, VPMADD52	Vector AES, SHA extensions, VPMADD52	Vector AES, SHA extensions, VPMADD52
Intel Optane memory support	Intel Optane Persistent Memory 200 Series (Barlow Pass) – validated on 4S only	Intel Optane Persistent Memory 200 Series (Barlow Pass)	Intel Optane Persistent Memory 300 Series (Crow Pass) – up to 2.6x 2R1W random access	Intel Optane Persistent Memory 300 Series (Crow Pass) – up to 2.6x 2R1W random access
Compute Express Link (CXL)	No	No	Yes; spec 1.1, 4 x16 devices	Yes; spec 1.1, 4 x16 devices
SKU shelves	Platinum, Gold SKUs All Barlow Pass capable	Targeted SKUs across all shelves (except Bronze)	All	All

Eagle Stream platform technologies

The Intel Eagle Stream platform supports the following technologies:

- Up to 64 cores, eight DDR5 memory channels, 80 PCIe 5.0 lanes, and four Ultra Path Interconnects (UPI) 2.0
- Thermal design power (TDP) up to 350 watts
- 16 GB-based DDR5 DIMMs up to 5600 MT/s
- Intel third AI-specific Advanced Matrix Extensions (AMX) built in Intel Deep Learning Boost (Intel DL Boost)
- Intel® Data Streaming Accelerator (Intel® DSA) for optimizing streaming data movement and transformation operations
- Intel QuickAssist Technology (Intel QAT) through Add-in-Card (AIC), which boosts security and performance
- Integrated High Bandwidth Memory (HBM) provides significant performance improvements for memory bandwidth-sensitive applications.
- Compute Express Link 1.1 (CXL)
- Intel Optane Persistent Memory 300 Series (PMem)
- Intel Virtual RAID on CPU (VROC), PCH SATA and NVMe RAID
- Intel Volume Management Device (VMD), Intel driver for NVMe SSDs